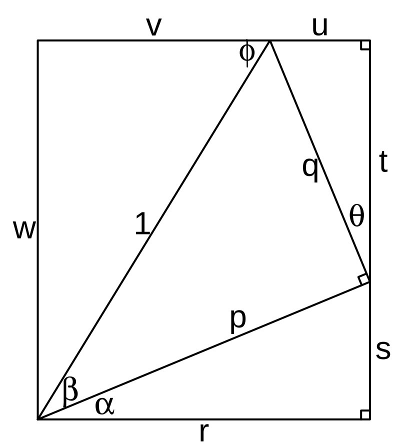
Question 1

In terms of α and β, express all the lengths and other angle measures (θ and ϕ).



Variable	Algebraic expression
$p\ =$	
$q\ =$	
$r\ =$	
$s\ =$	
$\theta\ =$	
$t\ =$	
$u\ =$	
$\phi\ =$	
$v\ =$	
$w\ =$	

Question 2

The angle-sum and angle-difference identities are listed below:

$$\begin{aligned}\sin(\alpha \pm \beta) &= \sin(\alpha)\cos(\beta) \pm \cos(\alpha)\sin(\beta)\\ \cos(\alpha \pm \beta) &= \cos(\alpha)\cos(\beta) \mp \sin(\alpha)\sin(\beta)\end{aligned}$$

You know the following:

$$\sin(315^\circ) = \frac{-\sqrt{2}}{2} \qquad \sin(30^\circ) = \frac{1}{2}$$

$$\cos(315^\circ) = \frac{\sqrt{2}}{2} \qquad \cos(30^\circ) = \frac{\sqrt{3}}{2}$$

Determine $\sin(345^\circ)$ exactly.

Question 3

Prove the (sine) double-angle identity: $\sin(2x) = 2\sin(x)\cos(x)$

(Hint: start with an angle-sum formula from Question 2.)

Question 4

Prove the (cosine) double-angle identity: $\cos(2x) = 2\cos^2(x) - 1$

(Hint: start with an angle-sum formula from Question 2. Also, you will need to use the Pythagorean Identity: $\sin^2(x) + \cos^2(x) = 1$*)*

Question 5

Prove the (cosine) half-angle identity: $\cos\left(\frac{y}{2}\right) = \pm\sqrt{\frac{1+\cos(y)}{2}}$.

(Hint: start with the double-angle identity from Question 4.)

Question 6

Given $\cos(54^\circ) \approx 0.59$, what is $\cos(27^\circ)$? Please set up an expression, but do **not** try to simplify or evaluate a decimal approximation.

(Hint: $54/2 = 27$.*)*